



**US Army Corps  
of Engineers  
HUNTSVILLE DIVISION**

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**Defense Environmental Restoration Program  
for  
Formerly Used Defense Sites**

**Ordnance and Explosive Waste  
Chemical Warfare Materials**

**ARCHIVES SEARCH REPORT**

**FINDINGS**

**CAMP BEALE & BEALE AIR FORCE BASE**

**Yuba & Nevada Counties, California**

**Site Nos. J09CA076600 & J09CA013600**

**OCTOBER 1993**

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**Prepared by  
US ARMY CORPS OF ENGINEERS  
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**ORDNANCE AND EXPLOSIVE WASTE  
CHEMICAL WEAPONS MATERIALS  
ARCHIVES SEARCH REPORT  
FOR  
CAMP BEALE & BEALE AIR FORCE BASE  
YUBA & NEVADA COUNTIES, CA.**

**DERP-FUDS SITE NOS. J09CA076600 & J09CA013600**

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ORDNANCE AND EXPLOSIVE WASTE  
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1.0 Introduction

1.1 Authority

In 1980, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 42 USC 9601 et seq. Ordnance and Explosive Wastes (OEW) are included in the CERCLA definition of pollutants and contaminants that require a remedial response.

In 1983, the Environmental Restoration Defense Account (ERDA) was established by Public Law 98-212. This Congressionally directed fund was to be used for environmental restoration at Department of Defense (DOD) active installations and formerly used properties. The DOD designated the Army as the sole manager for environmental restoration at closed installations and formerly used properties. The Secretary of the Army assigned this mission to the Corps of Engineers (USACE) in 1984.

The 1986 Superfund Amendments and Reauthorization Act (SARA) amended certain aspects of CERCLA, some of which directly related to OEW contamination. Chapter 160 of the SARA established the Defense Environmental Restoration Program (DERP). One of the goals specified for the DERP is "correction of environmental damage (such as detection and disposal of unexploded ordnance) which creates an imminent and substantial endangerment to the public health or welfare or to the environment."

The DERP requires that a CERCLA response action be undertaken whenever such "imminent and substantial endangerment" is found at:

- A. A facility or site that is owned by, leased to, or otherwise possessed by the United States and under the jurisdiction of the Secretary of Defense.
- B. A facility or site that was under the jurisdiction of the Secretary of Defense and owned by, leased to, or otherwise possessed by the United States at the time of actions leading to contamination.
- C. A vessel owned or operated by the Department of Defense.

The National Contingency Plan (NCP) was established by the Clean Water Act of 1972. The NCP has been revised and broadened several times since then. Its purpose is to provide the organizational structure and procedures for remedial actions to be taken in response to the presence of hazardous substances, pollutants, and contaminants at a site. Section 105 of the 1980 CERCLA states that the NCP shall apply to all response actions taken as a result of CERCLA requirements.

The March 1990 National Oil and Hazardous Substances Pollution Contingency Plan given in 40 CFR part 300 is the latest version of the NCP. Paragraph 300.120 states that "DOD will be the removal response authority with respect to incidents involving DOD military weapons and munitions under the jurisdiction, custody, and control of DOD."

On April 5, 1990, U.S. Army Engineer Division, Huntsville (USAEDH) was designated as the USACE Mandatory Center of Expertise (MCX) and Design Center for Ordnance and Explosive Waste (OEW). As the MCX and Design Center for OEW, USAEDH is responsible for the design and successful implementation of all Department of the Army OEW remediations required by CERCLA. USAEDH also designs and implements OEW remediation programs for other branches of the Department of Defense when requested. In cooperation with the Huntsville Division, the U.S. Army Corps of Engineers St. Louis District has been assigned the task of preparing Archives Search Reports (ASR) for those Formerly Used Defense Sites (FUDS) suspected of Chemical Warfare Materials (CWM) contamination.

## 1.2 Subject.

**Camp Beale and Beale Air Force Base** is located in Yuba and Nevada Counties approximately 10 miles east of Marysville, California (See Figure 1 & 2). It is about 40 miles north of Sacramento and 130 miles northeast of San Francisco, California.

This site has had both chemical warfare and ordnance/explosive activities. The first military use for this site was 'Camp Beale'. The mission was to train the 13th Armored Division. They used explosive munitions on several artillery ranges and did basic chemical warfare troop training. Then (in 1944) the Army added the 'West Coast Chemical Warfare School' (the school was later moved to the cooler climate of the Rocky Mountain Arsenal) to the activities at **Camp Beale and Beale Air Force Base**. Both of these activities conducted Chemical Warfare Training and the site is suspected to have had CW Agent Test Kits and CW munitions on it. Following the war, in 1945, the site became the CWM restocking point for equipment (gas masks) returning from the South Pacific Theater. Although this center was not tasked with the duty of processing the actual chemicals, the possibility does exist that some containers of agent, CW rounds, or contaminated material came to this facility.

The Air Force took over all of the property in 1947 (minus the Camp Beale leased lands) and used the land for bombing ranges. A portion of this land was cleared and demilitarized in the mid-1960's.

In the 1960's, the Army performed some biological warfare material destruction. The agent used was an anti-crop agent. The existence of biological warfare material is only mentioned in this report with no further research. The area where these tests occurred is located on the active Beale Air Force Base and this ASR concentrates on CWM and OEW.

### 1.3 Purpose.

This Archives Search Report, ASR, compiles information obtained through historical research at various archives and records-holding facilities, interviews with persons associated with the site or its operations, and personal visits to the site. All efforts were directed toward determining the possible use or disposal of chemical warfare materials on the site and documenting the existence of Ordnance and Explosive Waste, OEW. Particular emphasis was placed on establishing the chemical (agent), type of munitions or container, quantities, and area of disposal. While conducting the site survey, the team also pursued the documentation and locating of any high explosive waste or hazardous waste that may present some danger to the inhabitants or visitors. Information obtained during this process was used in developing recommendations for further actions at the site.

### 1.4 Scope.

As a result the intense and mixed training or practicing use on this site over the past 50 years, the entire FUDS is potentially contaminated with Ordnance and Explosive Waste, OEW or even Chemical Warfare Material, CWM. Records research and performed site investigations were performed for both CWM and OEW remains on the FUDS (the active portions of Beale Air Force Base were not included in this ASR). Through these investigations, several areas were targeted as having the highest potential for this type of contamination. These areas were primarily bombing ranges and maneuver areas. Clearance Certificates were granted for these areas before demilitarization, but since the areas are so vast and the training exercises are often imprecise, it is believed that certain dangers may exist far from the designated target areas. During the research and site investigations, every effort was made to gather and document contamination or danger areas anywhere on the FUDS. Map M-2 illustrates the 5 specific areas to be searched (primarily target and range areas) and Appendix G provides a listing of the relevant photographs taken at each location.

This report presents the history, description, and characterization of Beale Air Force Base. Toward that end, real estate ownership information, findings of a visual field survey (limited to surface inspection only), and an evaluation of potential ordnance contamination are included in the scope.

## 2.0 Previous Site Investigation.

### 2.1 The Inventory Project Report of 1991.

This report covers the site number J09CA076600. This INPR was prepared to address the eligibility for the DERP-FUDS program of the 1405.10 acres of leased land that was exsessed in 1944 and 1947. This property was known as 'Beale Air Force Base', Marysville Armoured Training Camp', and 'Camp Beale Triangular Division Camp'. No reports of explosive ordnance use was ever reported for this site. See Appendix C1.1.

### 2.1 The Inventory Project Report of 1993.

This draft report covers the site number J09CA013600, Camp Beale and Beale Air Force Base. This INPR accounts for the 85,654.29 acres (includes 572.59 Public Domain acres) that the Camp Beale and Beale Air Force Baseacquired from the Department of the Army in 1948. 52,369.55 of those acres were reported exsessed by the Air Force in 1959. Additional acres were sold off by various other agencies, leaving the Air Force Base with 23,078.33 fee acres and 25.6 easement acres in 1964. The 62,550.36 acres of exsessed land were determined elgible for the DERP-FUDS program, due to the lands use as a bombing and gunnery range and an Infantry and Armored division training area by the Army during World War II. It was also used by the Air force for bombardier-navigator training. All of this land was sold with 'surface use only' restrictions, due to the danger of subsurface ordnance that remain undetected.

This report states that: "There has been no record of ordnance uncovered during construction or agricultural activities in the area." Included in the report is a Risk Assessment Code, RAC, with a score of 2. See Appendix C1.2. This INPR was prepared by the Dynamic Corporation, 10365 Old Placeville Road, Suite 230, Sacramento, California 95827 for the US. Army Engineers District, Sacramento in January 1993.

### 2.2 Certificate of Clearance of 1959.

This Certificate of Clearance covers 2,747.52 acres of surplussed land. The certificate states:

"All of the above described land has been given a careful visual search and has been cleared of all dangerous and/or explosives material reasonable possible to detect. It is recommended that all lands described be restricted to surface use only, as it is possible that sub-surface ordnance remains undetected. All present and/or future owners and/or inhabitants of these lands are hereby advised that if, at any time, an item identified or suspicious of being military ordnance is located, the nearest government or civil authorities should be immediately notified." See Appendix C3.1.

### 2.3 Appraisal Report of 53,933 acres of Land at Camp Beale.

This report was submitted to the General Services Administration, GSA, on August 5, 1959. The contractor for the appraisal was 'George Hutchinson & Associates' who also performed subsequent appraisals in 1960 and 1962 (these reports have been included in Appendices C3.5 & C3.6). This 1959 appraisal discusses the 'surface decontamination' that was conducted in 1946, but goes on to state:

"A thorough decontamination of these target areas and the surrounding areas is essential. This is especially needed if these lands are to be put to their highest and best uses — primarily agriculture ... This decontamination needs to be in depth. It will involve a careful, slow, and laborious procedure, probably involving use of mine detectors and considerable digging. ..."

The 1962 appraisal reported that "...36,000 acres, in the Target Areas, ... Expert teams had furnished surface decontamination over a limited area and it was reliably reported that some exploration to a depth of five feet with metal detectors had been completed. Nevertheless the sale of this surplus land confined its utilization to surface use only." The report goes on to state that: "Parcel D - Borrow Pit - is located in Target Area #1 and might have been highly contaminated at one time. Investigation indicates however that the area in which Target Area #1 is located was decontaminated during the fall of 1958 by a crew of 42 decontamination experts using mine detectors. It is the local opinion that this area is free of unexploded shells. ... Parcel D will be used for a Borrow Pit on which excavation is reported as being limited to three feet." See Appendix C3.2.

### 2.4 US. Army Activity in the US. Biological Warfare Programs.

"In preparation for the President's announcement, the Department of the Army in August 1969, was directed to immediately cease all production of the biological agents and filling of dissemination devices. Guidelines for Biological Warfare Material, BW, demilitarization plans were formulated and plans were initiated for disposal of ... all anticrop material at ... Beale Air Force Base." ... "The TX (the casual agent of wheat stem rust) stockpile was stored at Beale Air Force Base". The disposal operation was conducted in several modified buildings on the Air Force Base. All material was incinerated with inactivation levels verified by 'microscopic examination of the ash for the presence of spores and by chemical analysis. The remains were then disposed of by "disking into the soil to a depth of six inches and planting the area with a cover of crop of millet."

This operation took place on the 'active' Beale Air Force Base and is therefore not part of the FUDS property that this ASR covers. The incident is included in this report for thoroughness in reporting research findings. See Appendix C4.1.

### 3.0 Site and Site Area Description

#### 3.1 Location.

Site J09CA013600, **Camp Beale and Beale Air Force Base** are located in Yuba and Nevada Counties, approximately ten (10) miles west of Marysville, California. The site is approximately 60,000 acres and is located on Figure 1.

**Camp Beale**, Site J09CA076600 is the leased land located in western Nevada County, at the southern edge of the old Camp Beale, approximately 19 miles southeast of Marysville, 17 miles southwest of Grass Valley, and 15 miles northwest of Auburn, California. The site is approximately 1400 acres in size.

The original use for the grassland and rolling hills area was as a settling point for the miners who immigrated to this area to seek their fortune in the mines. It is noted that almost every river, creek, or crevice was mined at one time. In fact, the DOD used one of these abandoned mining towns (Spenceville), as a battleground simulation for urban troop combat training. When the gold rush exhausted itself, a few miners remained on the land, pursuing agricultural endeavors. This went on until the DOD purchased or leased the land to make the Beale Military Reservation. The DOD's uses of the land are summarized both in section 5.0 Real Estate and 6.01 Historical Summary of OEW/CWM Activities.

#### 3.2 Interpretation of Aerial Photography.

Photo analysis and land use interpretation was performed at the site with the use of aerial photography from 1947, 1962, 1970-73 and 1989. The approximate negative scale of the photography is as follows:

February, 1947	1" = 2367'
July, 1962	1" = 2000'
May, 1970-73	1" = 2000'
August, 1989	1" = 2000'

The Camp Far West and Wolf, California, quadrangle maps were used as a reference for the photography. No photography was available for interpretation prior to 1947. Aerial photographs from 1947 appear to have areas, east of the mainbase, utilized for ordnance ranges. Maps from the period also indicate the presence of ordnance ranges. Impact craters were evident in the 1947 and 1962 photography. However, between 1947 and 1962 the base expanded, and a residential area is seen to have developed on a portion of the former ordnance ranges.

PROJECT  
LOCATION



FIGURE 1

CAMP BEALE AND  
BEALE AIR BASE  
YUBA AND NEVADA COUNTIES, C

DATE: July 1993. DATE OF MAP: 1993



During 1970-73 the overall area did not change, except for vegetation growth; However, Between 1970 and 1989 the area changes more residential are developed- on and off of the base, during the expansion of the infrastructure and ,finally, an Inter-Continental Billistic Missile (ICBM) site has been established in a portion of the ordnance range, per the facility map.

By 1989 the base is smaller than its size in 1952, and vast areas to the east are now designated as a wildlife refuge. The wildlife area was referenced by viewing a commerical map dated 1990. No impact craters were visible in these photos.

Site visits and investigations determined the area that once was chemical warfare storage area is not located on the FUDS property (all known as former 'gas' areas were on the currently active AFB).

### 3.3 Map Analysis.

The location of Beale AFB, California is in numerous sections of Townships 14 & 15 North and Ranges 5 & 6 East. In addition, the site can be referenced at 39 Degrees, 2 minutes and 30 seconds North; and Longitude 121 Degrees, 22 minutes and 30 seconds West.

The site was analyzed by referencing the USGS 7.5 minute quadrangle map from 1949. An annotation to this map displays the boundary of Beale Air Force Base, symbolized as the "Military Reservation Boundary." The map shows cemeteries, ranches, roads and topographical features.

In 1947, the U.S. Army, Office of the Sacramento District Engineer, South Pacific Division, developed a final project map of real estate, 1" = 4000'. This map displays when properties were acquisitioned, total land area, disposal of acres, transportation facilities and other boundary lines. The map includes a vicinity map in relation to the surrounding towns. This final project map revision was in 1955.

Dynamac Corporation, an environmental service company, developed a site map, .5" = 1 mile, of Yuba and Nevada Counties, Ca. This map developed for the INPR includes Beale Air Force Base, and encompasses the majority of the two counties. No other maps were used to analyze the site.

### 3.4 Current Uses.

The current use of the land for agriculture (primarily cattle/horse pastures and very limited orchard and planting activities) has remained the primary user of the land. Currently though, the land is beginning to be developed with cabins and even subdivisions. As the community continues to expand in this way, habitation and recreation will become the dominate use of the land. Today, the developments sell themselves as 'rural' areas, but as more families move into the area, so will the need for public improvements such as gasoline stations, groceries, schools, roadways, etc. This more intensive use of the land will certainly force a resolution of the hidden ordnance issue, so that the land owners can have titles free of 'surface use only' restrictions.

### 3.5 Demographics of the Area

#### A. Center of activity.

Camp Beale is located in the vicinity of Marysville, CA. Camp Beale is now known as Beale Air Force Base. Marysville and Yuba City, an adjoining community. These cities have numerous centers of activity such as the YMCA, Marysville High School, Yuba City High School, Yuba City Community College, Rideout Hospital, numerous malls and Ellis Lake recreational area.

#### B. Population Density.

City: Marysville  
Area: 3.6 sq.mi.  
POP: 12,324  
PD: 3,423 persons per sq.mi

County: Yuba  
Area: 640 sq.mi.  
POP: 58,228  
PD: 90 persons per sq. mi.

County: Nevada  
Area: 960 sq.mi.  
POP: 78,510  
PD: 82 persons per sq. mi.

Population and area are based on the U.S. Department of Commerce, Bureau of the Census, 1990 statistics, and telephone interviews.

### **C. Type of Businesses.**

A review of both telephone interviews and County Business Patterns (1990) assisted in developing a business profile of the area. Numerous retail and service establishments are located in Marysville.

### **D. Type of Industry.**

Light industrial activities are evident in the city of Marysville. A. Ferguson Engineering Corporation, manufacturer of camper shells; Acme Reinforced Plastics; All Pure Chemical Company, manufacturer of water purification chemicals; All West Aviation, aircraft rental, repair and charter services; and Bill's Casing Tongue Service; manufacturer of hydraulic casings and drills are a few of the manufacturers in the area. In addition, an enterprise zone has been established in the Marysville-Yuba City area.

In the rural areas, horse and cattle ranching is the primary source of industry.

### **E. Type of Housing.**

Housing in the city of Marysville is composed of multiple and single family housing. However, the ordnance areas are in rural areas. Private single family homes and base residential housing for military personnel are in these rural areas. There are also many cabin type residences in the rural areas surrounding the Beale Air Force Base.

### **F. New Development in the Area.**

There are numerous residential developments in the Marysville-Yuba City area. These homes range from \$75,000 to \$125,000. Many pockets of developments are coming about throughout the former Camp Beale.

### **G. Typical Cross-section of Population.**

The percent of those under the age of 18 is 26.9%, over 65 years is 14%. The median age is 32. Approximately 75.4% of the population is white, 10.9% hispanic, 5.2% black, 1.8% American Indian or Eskimo and 6.7% Asian or Pacific Islander. There are approximately 5,083 housing units with a median dollar value of \$71,700. The work force of Nevada county, including Marysville, is broken down into the following: manufacturing, 29.3%; non-manufacturing, 5.3%; agriculture, 2.3%; and other non-agriculture 63.1%.

## 4.0 Physical Characteristics of the Site

### 4.1 Geology/physiography.

The principal physiographic units in the study area are the dissected alluvial uplands west of the Sierra Nevada, the foothills section of the Sierra Nevada, and the Sierra Nevada Mountains. The dissected alluvial uplands consist of low hills and gently rolling country that merge with the foothills of the Sierra Nevada on the east and the low alluvial plains of eastern Sacramento Valley on the west. The foothills lie to the east of the alluvial uplands and are an undulating to very steep region at the base of the Sierra Nevada Mountains.

Geologic units that crop out in the study area include : basement complex of the Sierra Nevada of Paleozoic and Mesozoic age, volcanic rocks from the Sierra Nevada of Eocene and Pliocene age, Laguna Formation and related continental deposits of Pliocene and Pleistocene age, Victor Formation and related continental deposits of Pleistocene age, and river deposits of Holocene age (Olmsted and Davis, 1961). A summary of the geologic units is found in Table 4-1.

The basement complex of the Sierra Nevada consists of metamorphosed igneous and sedimentary rocks and of igneous batholiths and intrusives. It underlies all other rocks and deposits.

The volcanic rocks from the Sierra Nevada consist of poorly- to well consolidated fluvatile volcanic siltstone, sandstone, conglomerate, and shale, and volcanic breccia, tuff breccia, and tuff; they are predominantly andesitic and rhyolitic, and at Reeds Creek they are andesitic (Olmsted and Davis, 1961). The volcanic rocks from the Sierra Nevada dip gently southwestward.

The Laguna Formation and related continental deposits include three geologic units mapped by Piper and others in 1939 in the Mokelumne area, a few miles south of former Camp Beale and Beale Air Force Base: Laguna Formation, gravel deposits of uncertain age, and Arroyo Seco Gravel. The Laguna Formation is a sequence of predominantly fine-grained, poorly bedded, somewhat compacted continental sedimentary deposits. The gravel deposits are coarse grained, poorly sorted, and form a discontinuous cap on the Laguna Formation and older formations (Olmsted and Davis, 1961). The Victor Formation and related deposits consist of a heterogeneous assemblage of silt, sand, gravel, and clay transported by shifting streams from the Sierra Nevada (Olmsted and Davis, 1961). The river deposits consist of sand, gravel, silt, and minor amounts of clay. Outcrops approximate the boundaries of the natural levees of the rivers and creeks in the study area.

TABLE 4-1 GEOLOGIC STRATIGRAPHIC UNITS OF CAMP BEALE		
AGE	STRATIGRAPHIC UNIT	LITHOLOGY
Recent - Late Pleistocene	Victor Formation	Sand, gravel, silt and clay
Plio-Pleistocene	Laguna Formation	Silt, sand, gravel, and clay, includes Arroyo Seco Gravel
Mio-Pliocene	Mehrten Formation	Volcanic sandstone, siltstone, and conglomerate
Miocene	Valley Springs Formation	Rhyolitic ash, sand, conglomerate and clay
From: California Dept. Water Res. Bull. 74-5		

## 4.2 Soils.

Three primary near-surface soil profiles are present at **Camp Beale and Beale Air Force Base** and can be correlated by geomorphic location; alluvial upland, Sierran foothills or mountain series.

The alluvial uplands at **Camp Beale and Beale Air Force Base** are underlain by silty sands with gravel which cover the weathered granite bedrock surface. The surface soil consists of approximately 15 inches of a grayish brown, coarse-grained silty sand with gravel (United States Department of Agriculture, U.S.D.A., 1980). The subsoil is pale brown coarse-grained silty sand with gravel. The highly weathered granodiorite is about 30 inches below the surface. Permeability is moderately rapid. The hazard of erosion is moderate. In addition, these soils are moderately corrosive to uncoated steel.

The foothills of the Sierra Nevada at **Camp Beale** are underlain by sandy and gravelly silts, covering vertically tilted metamorphic rock (U.S.D.A., 1980). Typically the surface layer of the soil is strong brown gravelly silt with sand, about 4 inches thick. The subsoil is yellowish red gravelly silt with sand. At a depth of 20 inches metamorphic schist bedrock is encountered. Permeability is moderate. The potential for wind and water erosion of the site soils is slight to moderately high. Furthermore, these soils are highly corrosive to uncoated steel.

The near-surface stratigraphy of the lower Sierra Nevada within **Camp Beale and Beale Air Force Base** consists of rolling to steep soils and rock outcrops on mountainous uplands (U.S.D.A., 1980). Typically, the surface layer is brown silty gravel with sand about 2 inches thick. The subsoil is mixed yellowish brown and light yellowish brown silty gravel with sand. At a depth of 12 inches is hard slate. The infiltration rate for the site surficial soils is moderate, from 0.6 to 2.0 inches per hour. The potential for wind and water erosion of the site soils is moderately high. In addition, these soils are highly corrosive to uncoated steel.

In other words, the top soil is thin and solid, if it exists at all. Solid rock formations often protrude from the grass covered surface. For these reasons, the chances of ordnance burying itself below the surface are remote. The hard surface and low level of erosion make the grounds surface very difficult to crater, and yet once cratered the surface would stay that way for a long time.

#### 4.3 Hydrology.

The upper pool of the Far West Reservoir is bordering the southern boundary of Camp Beale (shown as a lake on the drawings). Bear River discharges are regulated by upstream reservoirs and diversions. Camp Far West Reservoir is a water supply reservoir owned by South Sutter Water District, and was completed in 1963. The maximum recorded discharge for this reservoir was approximately 35,900 cfs on February 18, 1986, and the minimum discharge was 7 cfs. The maximum recorded stage for the reservoir was 310.2 ft NGVD. Outflow from the reservoir must be 25 cfs for the months of April, May and June, and 10 cfs or inflow whichever is the lower for the remaining months.

A USGS gage, identification number 11423800, is located 1.2 miles downstream of Camp Far West Reservoir since October 1989. It has recorded a maximum daily discharge of 28 cfs and a minimum daily discharge of 10 cfs. This gage measures required fish-release flow, and is entirely regulated by the reservoir.

A USGS gage, identification number 11424000, is located on Bear River near Wheatland, California, and is approximately 4 miles downstream of the Camp Far West Reservoir. It has been in operation since 1929, and has recorded a maximum discharge of 48,000 cfs on February 17, 1986, and minimum discharge of 129 cfs on January 16, 1988. The drainage area for this gage is 292 square miles.

A USGS gage, identification number 11423800, is located on Bear Dam below Rollins Dam in Colfax, California, and is approximately 25 miles upstream of Camp Far West Reservoir. It has been in operation since 1912, and discharges have been regulated by Rollins Reservoir since 1964. The maximum discharge recorded since the construction of Rollins Dam was 22,500 cfs on February 17, 1986, and the minimum daily discharge of .5 cfs on November 17, 1964. The drainage area for this gage is 102 square miles.

Dry Creek and Rock Creek, tributaries of Bear River, drain the eastern two-thirds of Camp Beale. All but the smaller channels flow year-round. Several smaller streams drain the western third of the Camp area; Reeds Creek and Hutchinson Creek head in the hilly lands along the northern boundary and flow westerly across the gently sloping valley plains during the winter and spring months.

#### 4.4 Ground Water.

Ground water in the study area occurs in undifferentiated sedimentary rocks, volcanic rocks from the Sierra Nevada, the Laguna Formation and related continental deposits, the Victor Formation and related deposits, and in river deposits. Because these geologic units are both lenticular and gradational in texture, the details of ground-water occurrence differ from place to place. During periods of pumping, drawdowns vary from place to place, probably because of the numerous lenses of fine-grained material which partly confine the water and prevent uniform vertical movement through the aquifer. Partial confinement probably occurs beneath Camp Beale where beds of fine-grained material, of unknown areal extent, occur virtually throughout the water-bearing section. In general, though, nonpumping water levels in nearby wells of different depths are nearly the same, and ground water in the study area is considered to occur under unconfined conditions, with local confinement due to lenses of clay and silt (Page, 1980). Recharge to the aquifer in the study area is principally by loss of water from rivers to the aquifer. Recharge may also occur by seepage from precipitation, from intermittent creeks, and from surface water applied to irrigated fields (Page, 1980).

Local ground-water movement in the site area is generally to the south, toward a pumping depression in the NE<sub>1/4</sub> T. 14 N., R. 4 E. and the NW<sub>1/4</sub> T. 14. N., R. 5 E. This depression has been caused principally by the distribution and pumping of wells in the area and their distance from a recharge source (Rockwell, 1978).

#### 4.5 Weather.

The site lies within the South Coast Air Basin, which encompasses approximately 8,630 square miles in southern California. The climate of the basin is classified as mediterranean, characterized by a pattern of cool wet winters and warm dry summers. Typical dry summers are caused by a semipermanent high-pressure cell located over the eastern Pacific Ocean. This system generally blocks storms from moving into the basin during the summer months.

Climatological data for the area are summarized in TABLE 4-2. The data was collected at the Beale Air Force Base.

CLIMATOLOGICAL DATA FOR  
BEALE AIR FORCE BASE, CALIFORNIA  
TABLE 4-2

Month	Temperature <sup>1</sup> (°F)	Precipitation <sup>2</sup> (Inches)	Wind <sup>1</sup>	
			Speed Knots	Direction Degrees
January	46	4.10	4.0	140-160
February	51	3.35	4.0	140-160
March	54	3.21	5.0	140-160
April	59	1.70	5.0	140-160
May	67	.50	5.0	140-160
June	74	.21	5.0	170-190
July	79	.07	4.0	170-190
August	77	.10	4.0	170-190
September	73	.46	4.0	170-190
October	64	1.37	3.0	320-340
November	53	3.93	4.0	140-160
December	46	3.03	4.0	320-340
Average	62		4.0	
Annual total		22.16		

<sup>1</sup>Based on data collected from 1981-1991.

<sup>2</sup>Based on data collected from 1959-1991.

#### 4.5 Ecology.

The information provided for these sites has been compiled from the California Department of Fish and Game Natural Diversity Data Base and inquires to the U. S. Fish and Wildlife Service.

There are not any listings of threatened or endangered species or unusual natural communities for Camp Beale in the Natural Diversity Data Base. The U. S. Fish and Wildlife Service reports that one Threatened species, the valley elderberry longhorn beetle (Desmocerus californicus dimorphus) may occur in the area. Several candidate species for listing may also occur in the area, these are: California red-legged frog (Rana aurora draytonii), western spadefoot toad (Scaphiopus hammondi hammondi), northwestern pond turtle (Clemmys marmorata marmorata), greater western mastiff-bat (Eumops perotis californicus) and the Pacific western bit-eared bat (Plecotus townsendii townsendii).

Other state or federally listed species may also occur in the area. An on-site inspection by appropriate state and federal personnel may be necessary to verify the presence, absence or location of listed species or natural communities if remedial action is recommended as part of the final ASR.

## 5.0 Real Estate

### 5.1 DOD ownership.

According to the INPR, **Camp Beale**, California, Project Number J09CA076600, was acquired by the government prior to 1940. The **Camp Beale** military installation consisted of 85,056.1 fee acres from various owners, 572.59 Public Domain, PD, acres, and 1405.10 lease acres. The total 87,033.79 acres were formerly used by the Army, and was once known as the Marysville Armored Training Camp and Camp Beale Triangular Division Camp. The overall site was situated in Yuba and Nevada Counties, approximately 12 miles east of Marysville. The property included all of the necessary improvements to run a complete military reservation. In 1944 and 1947, the 1405.1 acres comprising leased property were terminated and have since been subdivided. Although the total 87,000 plus acres were all lands formerly constituting the old Camp Beale, for consistency of reference in this ASR, the 1405.1 acres located at the southern edge of the military reservation boundary are called the **Camp Beale FUDS**. Indications are this reported bivouac area was used by the Triangular Division Camp.

The Air Force later acquired on 10 November 1948, by transfer from the Department of the Army, the remaining 85,056.1 fee acres and 572.59 PD acres of old Camp Beale. With the subsequent addition of 25.6 easement acres, which were created by reservations in deeds disposing of fee interests, the total acreage for the Air Force base was 85,654.29 acres. The draft INPR **Beale Air Force Base**, Project No J0CA013600 details the site historical disposition of the lands. The final transaction listed in the draft INPR occurred on 9 December 1964, on which date, 4.52 fee acres were reported excess to GSA, with the remaining 23,078.33 fee acres and 25.6 easement acres comprising the continuing Beale Air Force Base. All 85,654.29 acres are eligible for the Defense Environmental Restoration Program, DERP, for Formerly Used Defense Sites, FUDS, with the exception of the remaining 23,078.33 acres now the active Air Force Base. The disposed properties are identified as the **Beale Air Force Base FUDS** in this ASR.

A notation must be a part of every property title on this excessed property.

"At the time of disposal it is possible that subsurface ordnance remain undetected, that all present and /or future owners and /or inhabitants of these lands be advised that if, at any time, an item identified or suspicious of being military ordnance is located, the nearest government or civil authorities should be immediately notified."

## 5.2 Present ownership.

The 62,575.96 excessed acres was sold off to 'numerous owners'. Today the large land tracts are being continually subdivided to developments of different kinds. The only DOD owned land is the 23,000+ acres known as Beale Air Force Base.

## 5.3 Significant Past Ownership other than DOD.

The Department of Defense has occupied through lease or ownership these tracts of land since before 1940. No other 'significant ownership' existed before the DOD.

The Wirth Environmental Services study conducted in 1987 (extracted from the CH2M Hill report developed in 1991 for the Active Military Base) identifies 108 locations on Beale Air Force Base with 'historical Activity'. The majority of these are historical structures, roads, and mining sites associated with 19th and 20th century homesteads, farmsteads, and mining operations. Immigrants to California in the early 1840's and 1850's were often attracted by the promise of gold. They travelled across the Sierras through Donner Pass and into the Sacramento Valley on their way to the Yuba gold fields north of Beale AFB. The last few miles of trail passed through what is now Beale AFB. Faint remains of this trail can still be found and traces through the grasslands of Beale. Settlement along creeks and rivers in and around Beale occurred as the influx of the '49ers increased. By late 1850, almost every ravine, gully, creek bed, and river along the western edge of the Sierras was being worked by miners. There is still evidence of excavations and mine shafts scattered about the rolling hills and flatlands of Beale. The legacy of the gold fields still remains at Beale where 200,000 tons of material from the Yuba River gold dredge piles were used as a base for streets during World War II.

The fact that mining was so widespread in this area is important because when mining is discontinued the caverns are abandoned. These abandoned shafts are prime disposal areas. No documentation has been uncovered relating any disposal to mine shafts, but the possibility does exist that disposal of this type did occur.

## 6.0 OEW/CWM site Analysis

### 6.1 Historical Summary of OEW/CWM Activities.

**Camp Beale** is located east of Marysville, California in Yuba and Nevada counties. The base was established in 1942 and had a total acreage of 87,076.03 acres; 85,098.34 acres acquired in fee simple, 572.59 acres transferred from other government agencies, and 1,405.1 acres leased. In 1947, the leases were canceled and on 25 June 1947 the remaining acreage was transferred to the War Assets Administration (WAA). (Semi-Annual Inventory, Owned, Sponsored and Leased Facilities, 1947). The 1,405.1 acres of leased land has been assigned the Project Number J09CA076600. The WAA initiated the sale of about 2,000 buildings and other facilities on Camp Beale at this time (Independent Herald, October 14, 1947). In early 1948, the property was withdrawn from the WAA and transferred to the Air Force to become Beale Air Force Base. In 1959, approximately 52,399.27 acres were declared surplus. Most of the acreage was sold. However, some was withheld by the Federal Power Commission for future power projects. This land was later released for sale. In 1962 an additional 9,268 acres were declared surplus and offered for sale (Saylor, 1962). In total, between 1959 and 1962, 59,450.62 acres of land were disposed of including 559.59 acres returned to the Department of the Interior. In 1964 and 1965, additional property was disposed of reducing the original **Camp Beale** property from 87,076.03 to the current Beale Air Force Base size of 23,078.33 acres. (Dynamac Corporation, 1993). The properties disposed of from 1959 through 1964 were assigned to Project Number J09CA013600.

The garrison, warehouse, and ammunition storage areas associated with **Camp Beale** and **Beale Air Force Base** were located in areas that are located on the current Beale AFB.

#### 6.1.1 Camp Beale Activities.

Assigned to the 4th Army, Western Defense Command, **Camp Beale** was originally established as a training post for the 13th Armored Division. The troops which would make up the 13th Armored Division started arriving in September of 1942 and the Division was officially activated on October 15, 1942. The 13th departed Beale in December 1943 and eventually ended up as part of the 3rd Army in Europe. Two other Divisions, the 81st and 96th Infantry, also trained at **Camp Beale**. **Camp Beale** provided a complete training environment for divisional training which included ranges for all of the division weapons plus areas for joint training with Army Air Corps units from bases such as Sacramento and Santa Rosa. (History of Beale Air Force Base, N.D.).

In 1943, recommendations were in progress to establish a Chemical Warfare School on the west coast. **Camp Beale** was selected and on 13 December 1943 the school was opened and designated the West Coast Chemical Warfare School. Four types of classes were initially scheduled to be taught at this school: a Unit Gas Officers Course (4 weeks), a Navy Gas Course for officers (6 days), a Gas Noncommissioned Officers Course (4

weeks), and a Navy Gas Course for enlisted personnel (3 days). Eventually a CWS Refresher (10 days), an CWS Familiarization (10 days), and an Air Raid Protection Course (6 days) were added. (Brophy and Fisher, 1959) A typical course had the following blocks of instruction: (from Navy Gas Course for enlisted personnel)

- a. War Gas Field Identification (using the Gas Identification Kit).
  - b. Training Techniques using the Gas Identification Kit.
  - c. Improvised Gasproof Shelters.
  - d. Incendiary Control.
  - e. Gas Chamber Exercise.
  - f. Incendiary Instruction.
  - g. Gas Reconnaissance
  - h. Gas Obstacle Course (Field exercise).
  - i. Night Bivouac (Field exercise).
  - j. Bulk Containers and Spray Tanks.
  - k. Explosives, Electric, Fire, Land Mines.
  - l. Chemical Weapons and Munitions Demonstration.
  - m. Flame Thrower.
- (Jennings, 1944)

By 1944 the threat of chemical warfare with the Japanese had diminished and in June 1944, the school was moved to Rocky Mountain Arsenal and renamed the Western Chemical Warfare School. (Porter, 1944).

In 1945, the Camp Beale ASF Depot was designated as a point for classification, rehabilitation, and repacking of CWS material returning from the Pacific Theater. (Gillet, 1945). It preformed this function through 1947, when it ceased operations as part of the closure of Camp Beale.

#### 6.1.2 Beale Air Force Base.

On 10 November 1948, **Camp Beale** came under Air Force control and became **Beale AFB**. The base was used to train bombardier-navigators in radar techniques and for six bombing targets (See map M-4) of approximately 1,200 acres each were established for this purpose. (Military Affairs Committee of Sacramento Valley, N.D.). These bombing targets were under the operational control of Mather Air Force Base. In 1956, a Joint Use Agreement between the Air Force and the Navy allowed the Navy to use two target areas at Beale AFB. (Maddux, 1956).

The Air Force decided to train navigation engineers at Beale AFB starting in 1951 and in 1952 portions of an Air Base Defense School was moved to this base from Parks AFB. These additional activities initiated a significant rehabilitation of the existing facilities which included construction of rifle, mortar, demolition, and machine gun ranges. (Military Affairs Committee of Sacramento Valley, N.D.) By 1957 the need for these

ranges had ceased to exist and on 30 November 1957 approximately 50,000 acres of Beale AFB were declared excess. By 1964 Beale AFB had been reduced to it's current size. (Declaration of Excess Land, N.D.).

## 6.2 OEW Activities.

Army weapons associated with ranges on **Camp Beale** include: Light, Medium, and Heavy Tanks, Self-propelled anti-tank guns, 37mm anti-aircraft guns, 105mm howitzers, and 81mm and 4.2in mortars. It is believed that all of these weapons except the 4.2in mortar were extensively used in the range areas of **Camp Beale**. Although the 4.2in mortar is a chemical weapon system, it was normally used to fire conventional high explosive and incendiary/smoke (White Phosphorus) munitions. Its use was most likely restricted to the Chemical School and to limited test firings by the ASF depot.

Air Force bombing targets were used by both the Air Force and the Navy. Additionally, the Air Force ranges for their base defense weapons systems were extensively used.

Various efforts were made to decontaminate the property prior to it's sale. However, the Certificate of Clearance documents indicate that the areas have been surface cleared only and recommend that all lands be restricted to surface use only. Contacts with the County Sheriff's Offices and military Explosive Ordnance Disposal units indicate that explosive munitions have been found on this property in the past. Considering that approximately 62,563 acres of **Camp Beale** and **Beale Air Force Base** were disposed of, it would be impossible for the entire area to have been cleared of OEW contamination and it is reasonable to assume that munitions are present and will continue to be recovered.

## 6.3 CWM Activities.

Sources of CWM can be associated with three types of activities on **Camp Beale** and **Beale Air Force Base**. The first is general chemical training for personnel assigned to this facility. The primary item of concern would be Gas Identification Kits and their components. These items are normally used in gas training areas usually located near the base gas chambers. The gas chambers have been located and they are on areas that are currently part of active Beale AFB. However, a possibility exists that these items may have been used as part of a field training exercise and could be found in those range areas where this type of training may have been conducted. This would include all of the range areas with the possible exception of munitions impact areas. No documentation has been recovered that indicates use of these kits. However, their use was a common practice.

The second source of CWM contamination is the West Coast Chemical School. A letter concerning training ammunition for the chemical school identified the CWM allocations per student (Williams, 1944). The following is a partial listing.

Chlorine	0.04 pounds /student
Grenade CM/DM, M6	0.14 /student
Set, Gas, toxic, M1	0.005 /student
Set, Gas Identification, Detonation, M1	0.015 /student
Shell, Chemical, 4.2", H fill	0.04 /student
H (mustard)	0.24 gallon /student

The school had facilities for 175 students at any one time. An 11 February 1944 inspection report indicates that during the time of the report the school had two classes running with a total of 92 students. The inspection report also indicated that the school was having a problem acquiring some of the CWM required for training (Johnston, 1944). This indicates that although the above quantities were authorized they may not have been used. The school and the school's toxic gas yard, which was used for decontamination training, has been identified as being located on the current Beale AFB. Training exercises were conducted in the maneuver/range areas of Camp Beale. These exercises involved mustard and chlorine agents along with various riot control and smoke munitions. The potential exists for munitions and bulk agent containers to remain in maneuver areas. It is assumed that if live agent was used, the possibility exists that decontaminating agents were used in the same areas and partially filled decontamination agent containers may remain in these areas. The students were also involved in firings and demonstrations of various chemical weapons systems which may have left residue in the range areas. No documentation has been found to indicate that these chemical weapons systems ever fired toxic projectiles into the impact areas.

The third activity is the Chemical Section of the Camp Beale Army Service Force (ASF) Depot. This section received and processed material returned from the Pacific Theater. It was responsible for receiving chemical warfare material, such as gas masks and 4.2in mortars, classifying the material, packaging serviceable material for shipment to designated storage depots or assigning it to salvage. No documentation has been found indicating they ever handled chemical munitions or bulk agent as part of their processing of returned materials. However, if they processed chemical weapons systems such as the 4.2in mortar, they may have had a small supply of ammunition for use in test firing returned weapons as part of the classifying process. This facility was located on what is currently part of Beale AFB, but if they did test firings it would have been conducted in the range areas.

#### 6.4 Biological Warfare.

Sometime between August 1969 and March 1972, Rocky Mountain Arsenal conducted a demilitarization program for anti-crop agents TX. This operation was conducted at Beale AFB. This operation was conducted by the Special Projects Division of Rocky Mountain Arsenal with assistance of Fort Detrick personnel. The Department of Agriculture and representatives from the State of California functioned as independent observers of all aspects of the operation. No ordnance was involved in this operation and there is no reason to believe that biological warfare material remains at this location. This operation was conducted on the current Beale AFB and not on any part of the FUD sites. (US Army Activity in the US Biological Warfare Programs, 1977).

#### 6.5 Archives Research Methods and Records Review.

The plan of action for the records search was to investigate regional and local archives and records centers due to their ease of access. This was followed by research at the national level.

##### 1. National Archives and Records Agency, Suitland Facility, Suitland, MD.

RG 77- Records of the Office of the Chief of Engineers. General information only.

RG 156- Records of the Office of the Chief of Ordnance. No information found.

RG 175- Records of the Chemical Warfare Service. No information found.

##### 2. Washington National Records Center, Suitland, MD.

RG 121- Records of the Public Buildings Service. No information found.

RG 270- Records of the War Assets Administration. No information found.

RG 338- Records of United States Army Commands. No information found.

##### 3. National Personnel Records Center, St. Louis, MO.

RG 338- Records of the United States Army Commands. No information found.

RG 342- Records of US Air Force Commands, Activities, and Organizations. No information found.

4. National Archives - Pacific Sierra Region, San Bruno, CA.

RG 77- Records of the Office of the Chief of Engineers. No information found.

RG 121- Records of the Public Buildings Service. Records on disposal of property with maps.

RG 181- Records of Naval Districts and Shore Establishments. Joint use agreement for bombing range.

RG 269- Records of the General Services Administration. No information found.

RG 291- Records of the Property Management and Disposal Service. Property disposal records including maps, quit claim deeds and general correspondence.

5. Federal Records Center, San Bruno, CA.

RG 77- Records of the Office of the Chief of Engineers. No information found.

RG 121- Records of the Public Buildings Service. Records of property disposal and appraisal reports.

RG 181- Records of Naval Districts and Shore Establishments. No information found.

RG 291- Records of the Property Management and Disposal Service. Property disposal reports and appraisal reports.

6. U. S. Army Military History Institute, Carlisle Barracks, PA.

Background information on Camp Beale and Beale AFB.

7. Fort McClellan Library, Ft. McClellan, AL.

Correspondence on establishment and operation of West Coast Chemical Warfare School.

8. Edgewood Historical Office, Edgewood Area, Aberdeen Proving Grounds, MD.

Information on Biological agent disposal program at Beale AFB.

9. U. S Air Force Historical Research Center, Maxwell AFB, AL.  
No information found.

10. Yuba County Library, Marysville, CA.  
Newspaper files for Bealiner post paper and local papers.

11. Beale Air Force Base, Civil Engineering, Environmental Flight Office, CA.  
General historical information and mapping.

12. Beale Air Force Base, Civil Engineering, Resource Flight, Real Property Office, CA.

Real Estate maps of Camp Beale and Beale AFB.

13. Beale Air Force Base, Base Historian, CA.  
History of Camp Beale and Beale AFB.

#### 6.6 Summary of Interviews.

Appendix E contains a listing of telephone conversations and interviews. Contact with Military Explosive Ordnance Disposal Units and County Sheriff's Offices indicate that explosive ordnance is still being recovered in those areas which constitute this FUD site.

#### 6.7 Site Inspection.

On 13 through 16 July 1993, this office conducted an inspection of the **Camp Beale and Beale Air Force Base** sites. The team examined the artillery impact areas identified from Camp Beale plus the bombing targets and impact areas associated with Beale AFB. Additionally, the team conducted a drive by survey of the range areas. The team had some difficulty in examining all suspect areas because of inaccessibility to certain private properties. Attempts were made to gain access to private properties and where the owner could not be contacted or permission to enter was denied, the team examined adjacent areas.

The team identified impact craters associated with Bombing Target # 6. These craters were found in the target area and immediately south of the target area. No other evidence of OEW contamination was observed. No evidence of OEW was observed at any other area inspected.

## **7.0 Site Evaluation**

### **7.1 CWM Contamination Evaluation.**

History proves that CWM definitely did exist at several different times on the Reservation. It certainly existed in training on the ranges and it may have existed in the storage and testing capacity of the site. The possibility of these CWM sources remaining on the site, in a potentially hazardous condition, has been diminished for several reasons.

1. The site has had several decontamination searches performed, some of which have been sub-surface searches with land mine detectors. The site has been considered clear of OEW/CWM for surface use to five feet in depth in many areas.
2. The soil surface conditions are so solid that any sub-surface activities (digging or explosion pitting) would be very limited.
3. CWM activities have not existed on the FUDS property, in any capacity, for thirty years (since the land was sold by the government). During that time, all portions of the property have been used for cattle grazing, ranching, recreation, or residential housing, and yet the records of CWM sitings or burials are extremely rare. The sitings will increase as development in the area grows, but the number of objects to be found has also decreased.
4. This archives search site visit only discovered cratering around several of the targets, but no remaining dangers were found to exist.
5. If exposed, mustard and lewisite would have decomposed to unarmful levels.

### **7.2 OEW Contaminated Areas.**

The potential for OEW to remain exposed is very small, for precisely the same reasons that CWM is unlikely to remain in the open on the FUDS property. Over time, with use of the land, and with additional range clearances the possibility of discovering surface ordnance is being statistically reduced to a point where reported sightings are very rare occurrences. Since the areas with the highest probability of having OEW (the targets, launching points, or storage areas) have been cleared and searched several times, the areas that could only have received OEW by mistake are the most likely to have not been thoroughly cleaned. These areas would exist on the far peripheries of targets or ranges (especially the 'night bombing ranges' that were used by the Air Force). The central areas of targets and ranges are more likely be hazard free for the following reasons:

1. The site has had several decontamination searches performed, a few of which have had sub-surface searches with land mine detectors. The site has been considered clear of OEW/CWM for surface use to five feet in depth in many areas.
2. The soil surface conditions are so solid that any sub-surface activities (digging or explosion pitting) and erosion would be very limited.
3. CWM activities have not existed on the FUDS property, in any capacity, for the past thirty years, since the government sale of these tracts of land. During that time, all portions of the property have been used for cattle grazing, ranching, recreation, or residential housing, and yet the records of CWM sitings or burials are extremely unusual. Each year the land is taken to higher levels of use, which increases the number of those exposed to the hazard, yet it also increases the possibility of discovering and reporting exposed ordnance.
4. This archives search site visit only discovered cratering around several of the targets, but no remaining dangers were found to exist.

ORDNANCE AND EXPLOSIVE WASTE  
CHEMICAL WEAPONS MATERIALS  
ARCHIVES SEARCH REPORT  
FOR  
CAMP BEALE & BEALE AIR FORCE BASE  
YUBA & NEVADA COUNTIES, CA.

DERP-FUDS SITE NOS. J09CA076600 & J09CA013600

**APPENDICES**

- A. REFERENCES.
- B. ACRONYMS.
- C. REPORTS/STUDIES/LETTERS/MEMORANDUMS.
- D. HISTORICAL PHOTOGRAPHS.
- E. INTERVIEWS.
- F. NEWSPAPERS/JOURNALS.
- G. PRESENT SITE PHOTOGRAPHS.
- H. NOT USED
- I. RISK ASSESSMENT CODE PROCEDURE FORMS.
- J. REPORT DISTRIBUTION LIST.
- K. ARCHIVE ADDRESSES.